UNIVERSITY OF SASKATCHEWAN

Department of Computational Science

CMPT 393.3

FINAL EXAMINATION

TIME: 3 hours ~~CLOSED BOOK~~

NAME: _____

STUDENT NO. _____

Approximately 20% for every question.

Please use the space provided for your answer. If necessary, use the back of the page.

Results (For official use only)

1)

2)

3)

4)

5)

NOTE: Give your ideas for solution to obtain partial marks. If intermediate results cannot be obtained, invent them and continue.

2. In a distribution centre, customers first do the selection, and then pay for their purchases at a cashier. To help the customers make their selection, there are 5 salesmen. Customer arrivals at the centre form a Poisson process with an arrival rate of 30/hr. 80% of the arrivals, or 24/hr will ask for a salesman, whereas the remaining 20% of the arrivals proceed directly to the cashier. The service time of a customer with a salesman is exponential with an expectation of 10 minutes. The time to pay is also exponential with an average of 90 seconds.

   a) What is the average proportion of time the cashier is idle?

   b) What is the time per hour available for the salesman to do other jobs, such as filling shelves?

   c) What is the probability a customer has to wait for a salesman?

   d) What is the average number of customers in total in the store?

   e) What is the probability a customer has to wait for over 5 minutes until a salesman is available?

4. The NASA has made available 12 pounds on the next space shuttle for scientific experiments, and you are to decide how to distribute the weights among the experiments. In particular, there are three experiments NASA is considering. The project leaders have given 3 versions for each experiment, namely a minimal version, a standard version and an extended version. Table 2 gives the weight of the equipment for each version, as well as the expected utility to mankind in dollars. Formulate the problem as a dynamic programming problem, and solve it as such.

Table 2: Weights and benefits for each experiment

	minimal version		normal version		extended version	
experiment	weight	benefit	weight	benefit	weight	benefit
1	2	1000	4	2000	5	2500
2	5	1000	7	2500	8	4000
3	3	1000	4	1500	5	2000

a) Define states, stages and decisions.

state:

stage:

decisions:

reasons:

b) Do the calculations to obtain the optimal allocation.